DOCKET: TPR110014000 PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

INVENTOR:	Richard F. Crook	)	EXAMINER:	Allen J. Flanigan
SERIAL NO.:	10/725,758	)	ART UNIT:	3743
FILING DATE:	December 1, 2003	)	DATE:	July 28, 2005
FOR:	Resiliently Bonded Heat Exchanger	)		

DECLARATION UNDER RULE 131

Mail Stop ______________
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

I, Richard F. Crook, do hereby declare as follows:

1. I am a consultant to Proliance International, Inc., formerly Transpro, Inc., the assignee of the above-identified patent application entitled "Resiliently Bonded Heat Exchanger." I am the inventor of the invention described and claimed in the above-identified application, which is a divisional of parent application serial no. 09/847,144 filed on May 2, 2001, now U.S. Patent No. 6,719,037 issued on April 13, 2004.

2. This is a declaration under the provisions of 37 CFR § 1.131 for the purpose of swearing back of a reference which was cited in the subject application. This declaration establishes facts showing conception of this invention in this country prior to

the April 4, 2001 filing date of Jones U.S. Patent Publication No. US 2002/0144808 A1 cited against this application, and due diligence from a time prior to April 4, 2001 until the parent of the above-identified application was filed on May 2, 2001.

3. The claimed invention in the above-identified application was conceived by me in the United States prior to April 4, 2001. This is evidenced by the appended copy of a portion of an invention disclosure created by me describing the invention disclosed in the subject patent application (the "Disclosure"), attached hereto as Exhibit A. The Exhibit A Disclosure includes drawings created by me of different embodiments of the subject invention. Encircled page numbers have been added to the Disclosure to assist in identifying relevant portions.

4. The Disclosure was created, and is dated as being created, prior to April 4, 2001, the filing date of the Jones patent publication. Actual dates prior to April 4, 2001 have been redacted.

5. The invention claimed in claim 12 of the subject application is directed to a method of making a heat exchanger, and the invention claimed in claim 50 of the subject application is directed to a heat exchanger. The following chart compares the invention of claims 12 and 50 with the teachings in the Disclosure of Exhibit A:

CLAIM 12	DISCLOSURE
A method of making a heat exchanger comprising the steps of:	"[A] resiliently bonded charge air cooler or other heat exchanger." Disclosure, page 1.
providing a header defining openings, said header openings adapted to receive a plurality of tubes;	"Figure 5 ... Tube –to-header joints can be brazed with the rest of the core in the CAB process prior to bonding the tanks in place." Disclosure, page 2; Header "HDR" shown receiving tube "CAC TUBE." Disclosure, Fig. 5, page 5.
providing a tank having an inner cavity, said tank being assembled with said header;	Tank "MAN. TANK" with inner cavity shown assembled to header "HDR." Disclosure, Fig. 5, page 5.
inserting said tubes into said header openings and fixedly attaching said tubes to said header such that said tubes extend through said header openings and open ends of said tubes communicate with said tank inner cavity;	" Figure 5 ... Tube –to-header joints can be brazed with the rest of the core in the CAB process prior to bonding the tanks in place." Disclosure, page 2; Tank "MAN. TANK" shown assembled to header "HDR" shown receiving tube "CAC TUBE" with the ends of the tube communicating with the tank inner cavity. Disclosure, Fig. 5, page 5.
applying substantially uncured fluid sealing material between said tank and said header defining a joint such that said header and said tank are connected by said sealing material; and	"Form-in-Place silicone sealants are applied to the parts in viscous liquid condition and are cured, usually by room-temperature-vulcanizing (RTV), after assembly of the parts. ... Figure 5 ... a flexible tank-to-header joint created by applying a Form-in-Place silicone to the gap between the tank and header." Disclosure, page 2.
curing said sealing material of said joint such that said sealing material provides a flexible, bonded, liquid tight, header-tank joint.	"600°F SILICONE BOND OF TANK/HDR PROVIDES FLEX FOR THERMAL EXP. OF CORE." Disclosure, Fig. 5, page 5.

CLAIM 50	DISCLOSURE
A heat exchanger which comprises:	"[A] resiliently bonded charge air cooler or other heat exchanger." Disclosure, page 1.
a plurality of tubes having predetermined dimensions, said tubes including an outer surface and being open at one end;	"CAC TUBE." Disclosure, Fig. 5, page 5.
a header structure defining a plurality of openings, said openings receiving said tubes, said tubes being fixedly attached to said header structure;	" Figure 5 ... Tube –to-header joints can be brazed with the rest of the core in the CAB process prior to bonding the tanks in place." Disclosure, page 2; Header "HDR" shown receiving tube "CAC TUBE." Disclosure, Fig. 5, page 5. "Figure 6 shows how a formed header, with wells formed around the oversized tube holes, is slipped over the tubes of a headerless core. The header is then flooded with 600F RTV silicone so that the wells fill up and a thin layer is over the entire header." Disclosure, page 3; Plurality of "TUBES" secured in openings in header "HDR" with "RTV SILICONE." Disclosure, Fig. 6, page 5.
a tank positioned above said header structure, said tank and said header structure defining a gap therebetween, said gap being adapted to receive bonding material; and	Tank "MAN. TANK" shown assembled to header "HDR" with gap. Disclosure, Fig. 5, page 5; Figure 5 ... a flexible tank-to-header joint created by applying a Form-in-Place silicone to the gap between the tank and header." Disclosure, page 2. "Figure 6 ... The cast or fabricated manifold [tank], sized for a 1/8 inch gap to the header all around, is set in place ... ." Disclosure, page 3; Tank "MANIFOLDS" shown assembled to header "HDR" with gap. Disclosure, Fig. 6, page 5.

a sealing member including a cured bonding material which forms a flexible bond between said tank and said header structure.	Figure 5 ... a flexible tank-to-header joint created by applying a Form-in-Place silicone to the gap between the tank and header." Disclosure, page 2; "600°F SILICONE BOND OF TANK/HDR PROVIDES FLEX FOR THERMAL EXP. OF CORE." Disclosure, Fig. 5, page 5. "Figure 6 ... The cast or fabricated manifold [tank], sized for a 1/8 inch gap to the header all around, is set in place and the edge gap filled with RTV." Disclosure, page 3; "RTV SILICONE" shown in gap between tank "MANIFOLDS" and header "HDR." Disclosure, Fig. 6, page 5.

6. The Disclosure of Exhibit A was submitted by me to the patent law firm of DeLio & Peterson, LLC of New Haven, Connecticut for preparation of the parent of the instant patent application prior to April 4, 2001.

7. On April 9, 2001, I received a draft of the parent application by facsimile from DeLio & Peterson. I reviewed this draft and subsequently returned a copy with my comments.

8. On April 23, 2001, I received a further draft of the parent application by facsimile from DeLio & Peterson.

9. On April 24, 2001, DeLio & Peterson sent to me the completed patent application for my review and signature.

10. On or about May 1, 2001, I returned the executed patent application to DeLio & Peterson, and the parent application was filed with the U.S. Patent and Trademark Office on May 2, 2001.

11. I declare further that all statements made on my own knowledge are true and that all statements made herein on information and belief are believed to be true; and further that these statements and the like so made are punishable by fine or imprisonment or both, under §1001 of the Title XVIII of the United States Code and that such willful false statement may jeopardize the validity of the application or any patent issuing thereon.

Richard F. Crook
Name: Richard F. Crook

July 26, 2005
Date

CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service on the date indicated below as first class mail in an envelope addressed to Mail Stop ________, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

Name: Barbara Browne Date: July 29, 2005 Signature: Barbara Browne

tpr110014000r131decl.doc

******************PATENT DISCLOSURE******************

INVENTOR Richard F. Cook DATE [redacted]

READ & UNDERSTOOD BY ____________ DATE [redacted]

READ & UNDERSTOOD BY ____________ DATE [redacted]

TITLE: RESILIENTLY BONDED HEAT EXCHANGER

BACKGROUND: Heat exchangers of many types, such as radiators, charge air coolers, oil coolers, etc., suffer limited life as a result of high working stresses at their tube-to-header joints. These stresses are a result of thermal expansion and contraction of the tubes, thermal changes in header length, and variations in internal pressure during operation. Since the tubes are usually rigidly attached to a relatively inflexible header by means of soldering, brazing, welding or the like, the resulting stresses ultimately lead to joint fatigue failure or tube fatugue failure in the area next to the joint.

In an effort to minimize or eliminate the stresses described above, some heat exchangers have been made with grommeted tube-to-header joints. In such heat exchangers, tube holes in the headers are made to be oversize with respect to the tubes. These holes are fitted with resilient grommets, usually made of high temperature silicone rubber. The grommets have openings slightly smaller than the tubes, so that when the tubes are pushed through the grommets the compression fit provides a leak-free connection of each tube to the header. The heat exchanger assembly involves the tedious handling of numerous small parts (the grommets), and lacks any real bond between the tubes and the headers, relying solely on the compression fit to provide a seal. To achieve the desired compression fit with the grommets, the fit-up of the core tubes to the grommeted header holes must be critically maintained through close dimensional tolerances.

Heat exchangers have also been made with specially made resilient headers. In such heat exchangers, a rigid metal header with oversize tube holes is fitted with loosely fit brass ferrules in each tube hole. The brass ferrules are then bonded to the metal header by molding silicone rubber around each ferrule. The brass ferrules are later soldered to brass heat exchanger tubes. These specially molded resilient headers are extremely expensive to produce, and great care must be exercised in the soldering operation to prevent destruction of the silicone bond to the ferrules.

DESCRIPTION OF THE INVENTION: The inventor conceived, and hereby discloses, a number of ideas related to making a resiliently bonded charge air cooler or other heat exchanger which would have the same long-life properties as heat exchangers with resilient headers or grommeted tube-to-header joints, but which would be much simpler to produce, have fewer parts, require less critical dimensional tolerances and, in some versions, provide truly bonded joints.

INVENTOR Richard F. Crook DATE [redacted]

READ & UNDERSTOOD BY John [illegible] DATE [redacted]

READ & UNDERSTOOD BY [illegible] DATE [redacted]

All of the inventions conceived by the inventor make use of either Form-in-Place or Cured-in-Place high temperature silcone sealants. Form-in-place silicone sealants are applied to parts in the viscous liquid condition and are cured, usually by room-temperature-vulcanizing (RTV), after assembly of the parts. Loctite 5920 is an example of an RTV silicone material with a working temperature range of –65F to +600F. Cure-in-Place silicone sealants are applied to parts and cured, usually by Ultra-Violet radiation, before assembly. The parts are then assembled with the silicone in the cured condition. Loctite 5960 FastGasket silicone is an example of such a U/V-cured material.

The attached Figure 1 shows various header configurations to which a Cure-in-Place silicone bead could be applied. The header holes would be slightly larger than the tubes. The FastGasket Cure-in-Place beads would create tube holes slightly smaller than the tubes. After curing of the beads, the headerless core tubes could be inserted into the headers just as is done now with grommeted headers.

An alternative to this would be to insert the tubes into the oversized header holes and then apply beads of Form-in-Place silicone around the tubes. The resulting appearance would still look like Figure 1, A though C. (Putting the bead on the fin side of the tube as shown in Figure 1D would be difficult with Form-in-Place silicone.)

Figure 2 shows how teflon mandrels might be used to control the ID of the FastGasket beads during application and curing. The mandrels would have dimensions slightly smaller than the tubes so that the resulting beads would be a compression fit to the tubes.

Figure 4 shows how FastGasket beads might be applied to one-piece cast manifolds or to fabricated manifolds made by welding headers to cast or fabricated tanks. It should be noted that molded plastic manifolds, either of one-piece or with crimped-on metal headers could be used on the low-temperature outlet side of the heat exchanger.

Figure 3 shows how a FastGasket coating might be applied to the tubes, cured in place, and then the tubes would be slipped into the metal headers.

Figure 5 shows a radical departure from current flexible tube-to-header joints, to a flexible tank-to-header joint created by applying a Form-in-Place silicone to the gap between the tank and the header. If the manifolds are welded or bolted to the side columns, the unit can be mounted by means of the tanks or the side columns. The brazed core is free to thermally expand and contract, or mechanically vibrate, independent of the tanks and side columns. Tube-to-header joints can be brazed with the rest of the core in the CAB process prior to bonding the tanks in place.

INVENTOR Richard F. Crook DATE [redacted]

READ & UNDERSTOOD BY John Kolb DATE [redacted]

READ & UNDERSTOOD BY [illegible] DATE [redacted]

Figure 6 shows how a formed header, with wells formed around the oversized tube holes, is slipped over the tubes of a headerless core. The header is then flooded with 600F RTV silicone so that the wells fill up and a thin layer is over the entire header. The cast or fabricated manifold, sized for a 1/8 inch gap to the header all around, is set in place and the edge gap filled with RTV. The manifolds are welded or bolted to side pieces to form a rigid structure. Now both the header can flex with respect to the manifold, and the tubes can flex with respect to the headers.

ADVANTAGES OF THE INVENTION: The ideas conceived by the inventor allow a heat exchanger to be made which has all the long-life properties of heat exchangers with resilient headers or grommeted tube-to-header joints, but which would be much simpler to produce, have fewer parts, require less critical dimensional tolerances and, in some versions, provide truly bonded joints for improved leak-tight integrity.

Some particular advantages of the approach shown in Figure 6 are that the cast manifold would not require machining, since the fit of the manifold to the header is not critical; there are no loose grommets to handle or install; the fit-up of the tubes to the header is not critical, so core tolerances can be relaxed; and the application of the silicone does not require the precision of some of the other silicone applications discussed here. As with the approach of Figure 5, the Figure 6 approach provides a rigid structure of side members welded or bolted to the manifolds so that mounting can be accomplished from either the manifolds or the side members. The side members may even be gusseted to the manifolds, leaving the tank-to-header and tube-to-header joints resilient. Note that the purpose of the wells on the header is to lengthen the silicone bond between tubes and header for better sealing.

DATE FIRST CONCEIVED: The invention disclosed above was conceived by Richard F. Crook [redacted] and recorded on sketches made, initialed and dated on that date. A Company Confidential memo dated [redacted] disclosed the invention to Joseph JuGer, John Kolb and John DellaVentura.

POSSIBLE FLEX-JOINT CAC'n

RFC [redacted]

- FAST GASKET APPLIED TO HDR + CURED B4 ASSY
- LIQUID FORM-IN-PLACE RTV APPLIED TO T/H JTS. BY ROBOT.

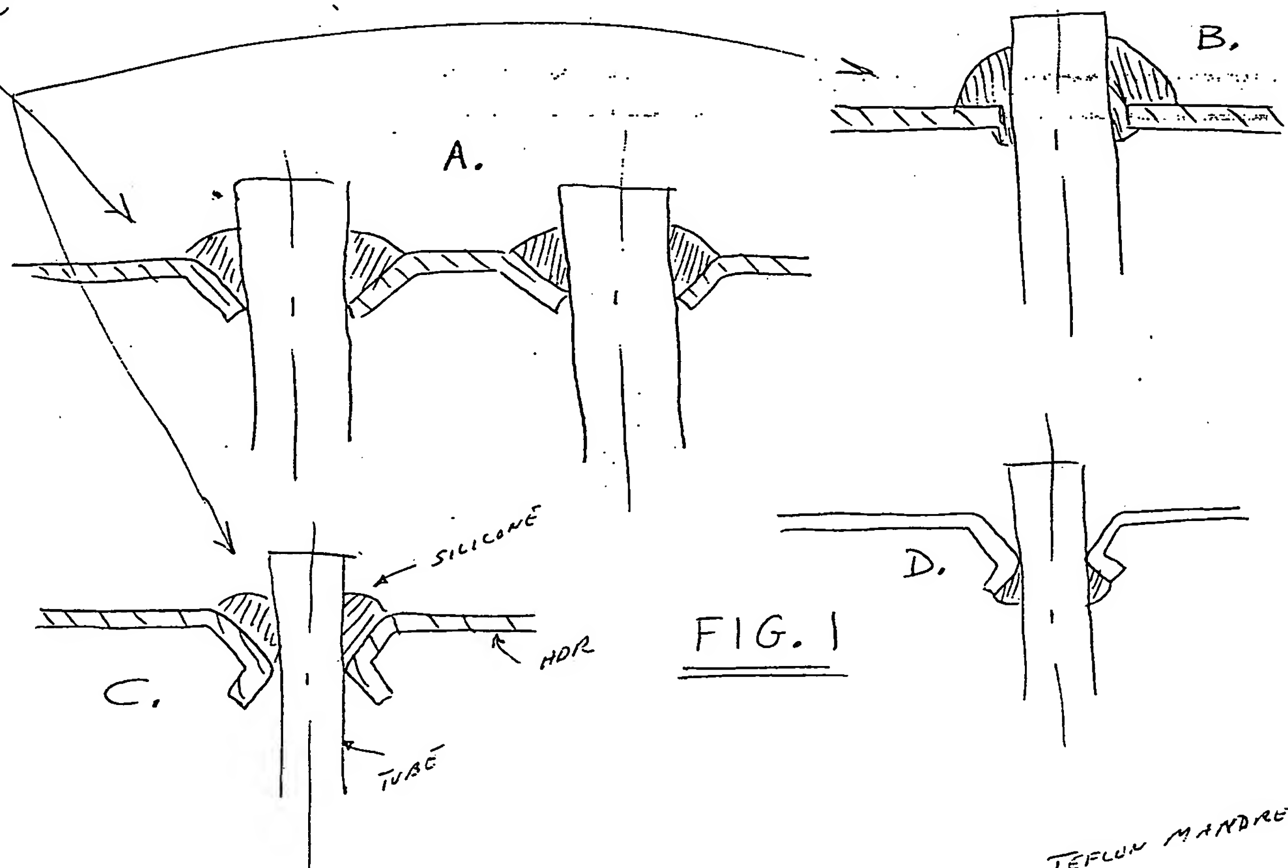


FIG. 1

- POSSIBLY FORM SILICONE OR FAST GASKET AROUND TEFLON MANDRELS, CURE, AND ASSEMBLE TO TUBE DRY

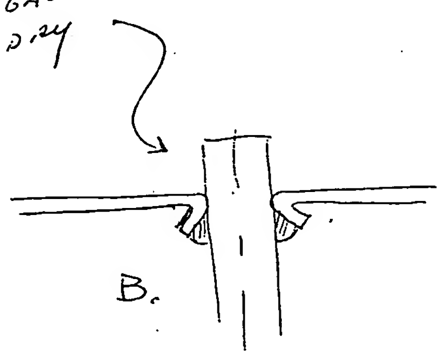
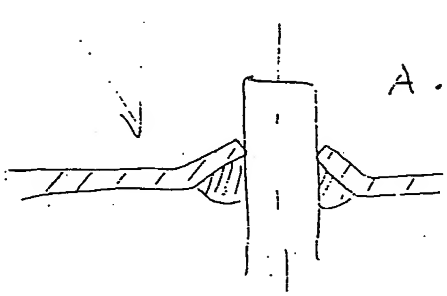


FIG. 2



INVENTOR: Richard F. Crook [redacted]

WITNESS: [illegible] [redacted]

WITNESS: [illegible] [redacted]

(FASTGASKET BE)

- APPY TO 1PC CASTING, ELIMINATES LOOSE GROMMETS.

RFC [redacted]

INVENTOR: Richard F. Cook [redacted]

WITNESS: [redacted]

WITNESS:

- APPY TO TUBES, CORE B4 ASSY.

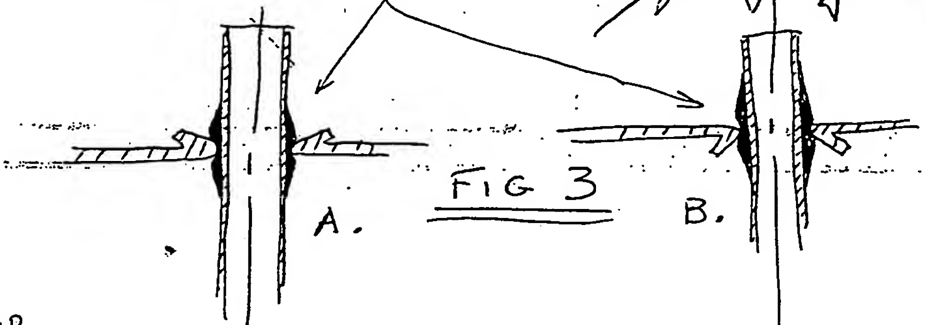


FIG 3

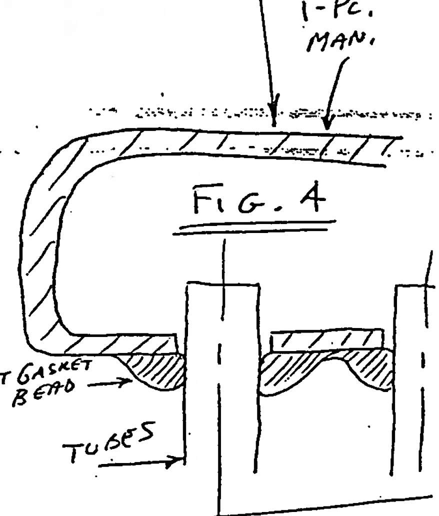


FIG. 4

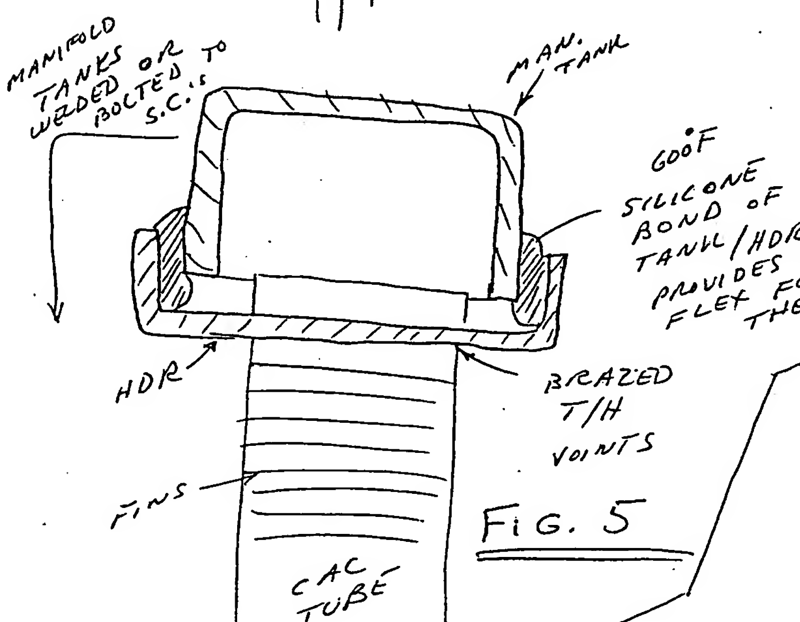
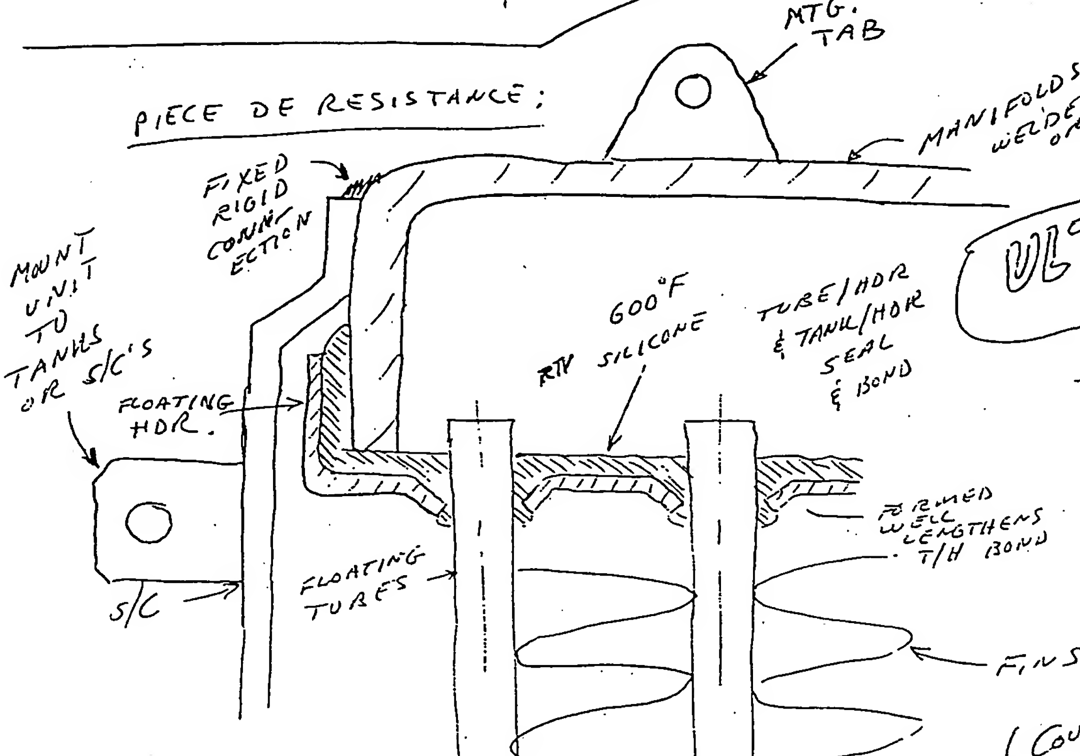


FIG. 5

ADV.: NO MACHINING OF MANIFOLD
NO LOOSE GROMMETS.
NON-CRITICAL APPLICATION OF SILICONE BEAD.
FIT-UP OF TUBES TO HDRS IS COMPLETELY NON-CRITICAL

PIECE DE RESISTANCE:



ULTRA-SEAL 2000 TM

SILICONE FLOODS FORMED HDR AFTER TUBES ARE IN PLACE.

FIG. 6

(COULD BE APPLIED TO OTHER HEAT EXCHANGER AS WELL.)